Students of color who work with communities of color

We Are STRONG Coasts

Strong Coasts is a community-engaged training and research program on systems thinking to better manage complex and interconnected food, energy and water systems in coastal locations.

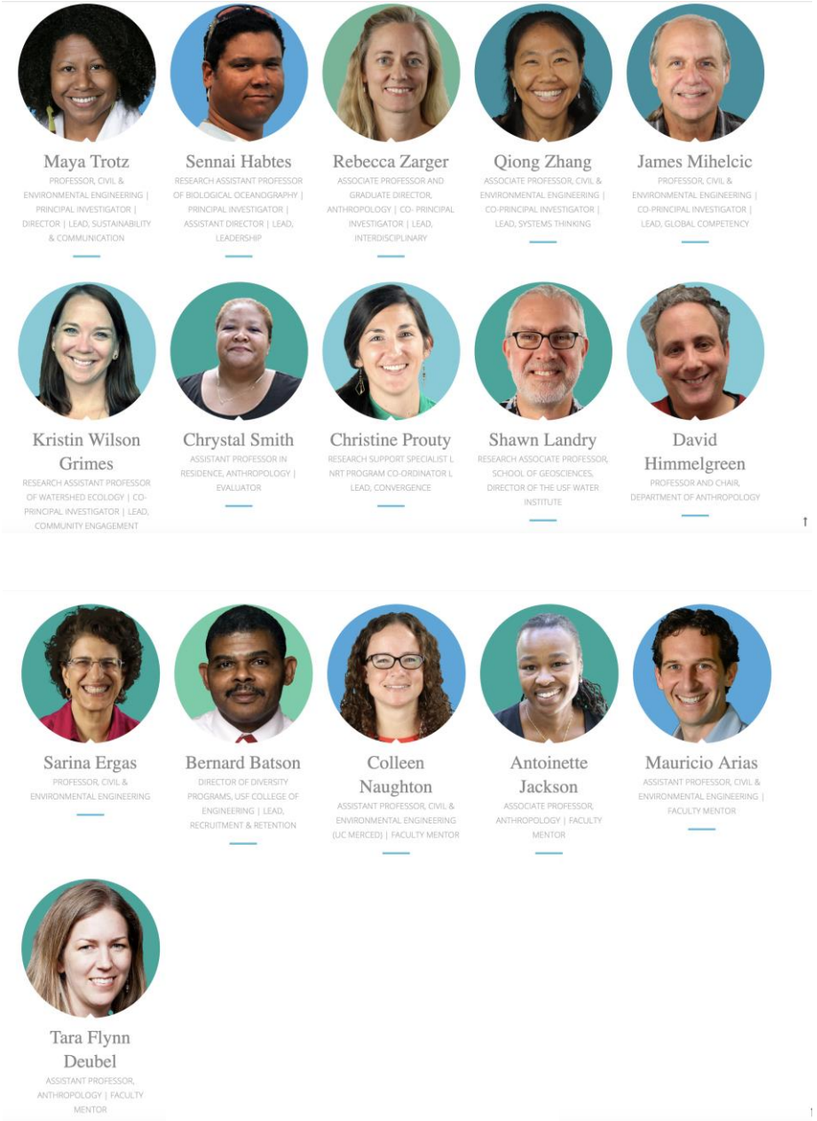
Maya Trotz, Ph.D. ENV SP, Professor, Civil & Environmental Engineering, University of South Florida

2019 NSF RESEARCH TRAINEESHIP (NRT) ANNUAL MEETING

SEPTEMBER 25 - 27, 2019 | NORTHWESTERN UNIVERSITY | EVANSTON, IL | #NRT201

Collaborative National Research Traineeship

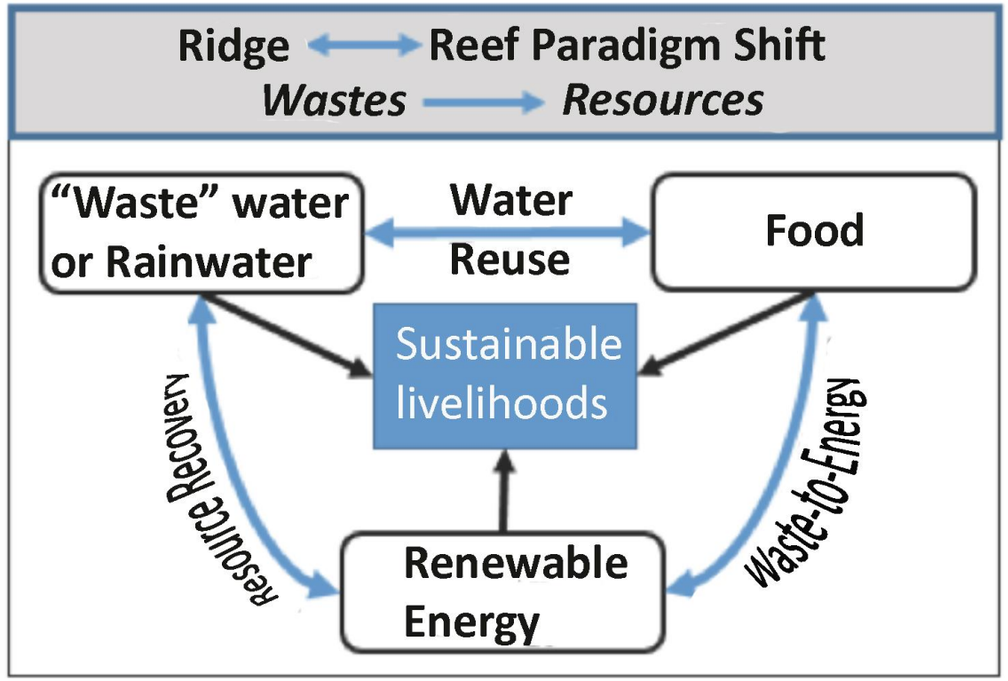
Strong COASTS



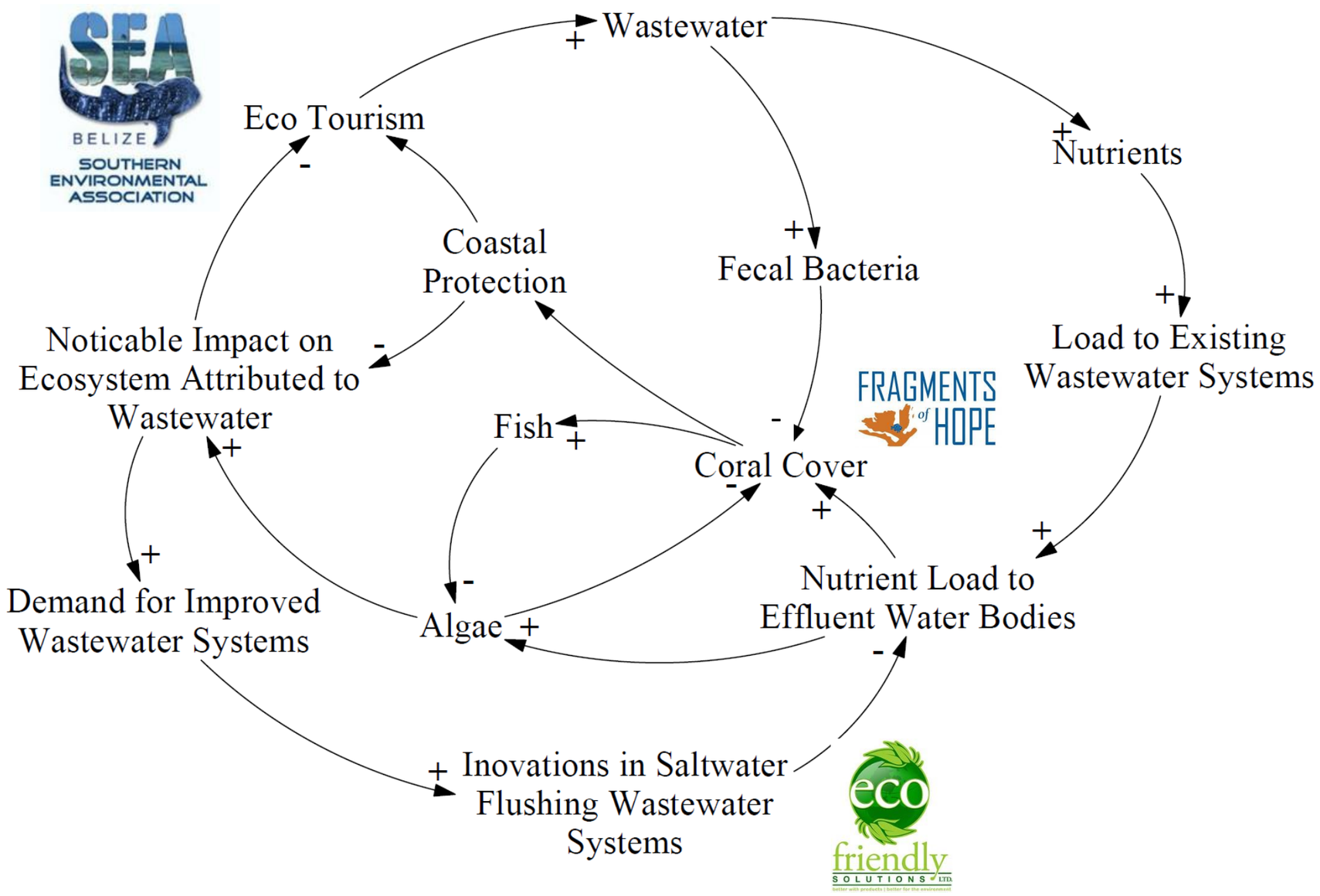
Strong COASTS

GUIDING RESEARCH QUESTION

What are the leverage points (technological, regulatory, organizational) in food-energy-water systems (FEWS) in a specific geographic context to improve the sustainability of the overall system across different scales?



Community Engaged Research
Interdisciplinary Research & Education
Systems Thinking
Global Competency



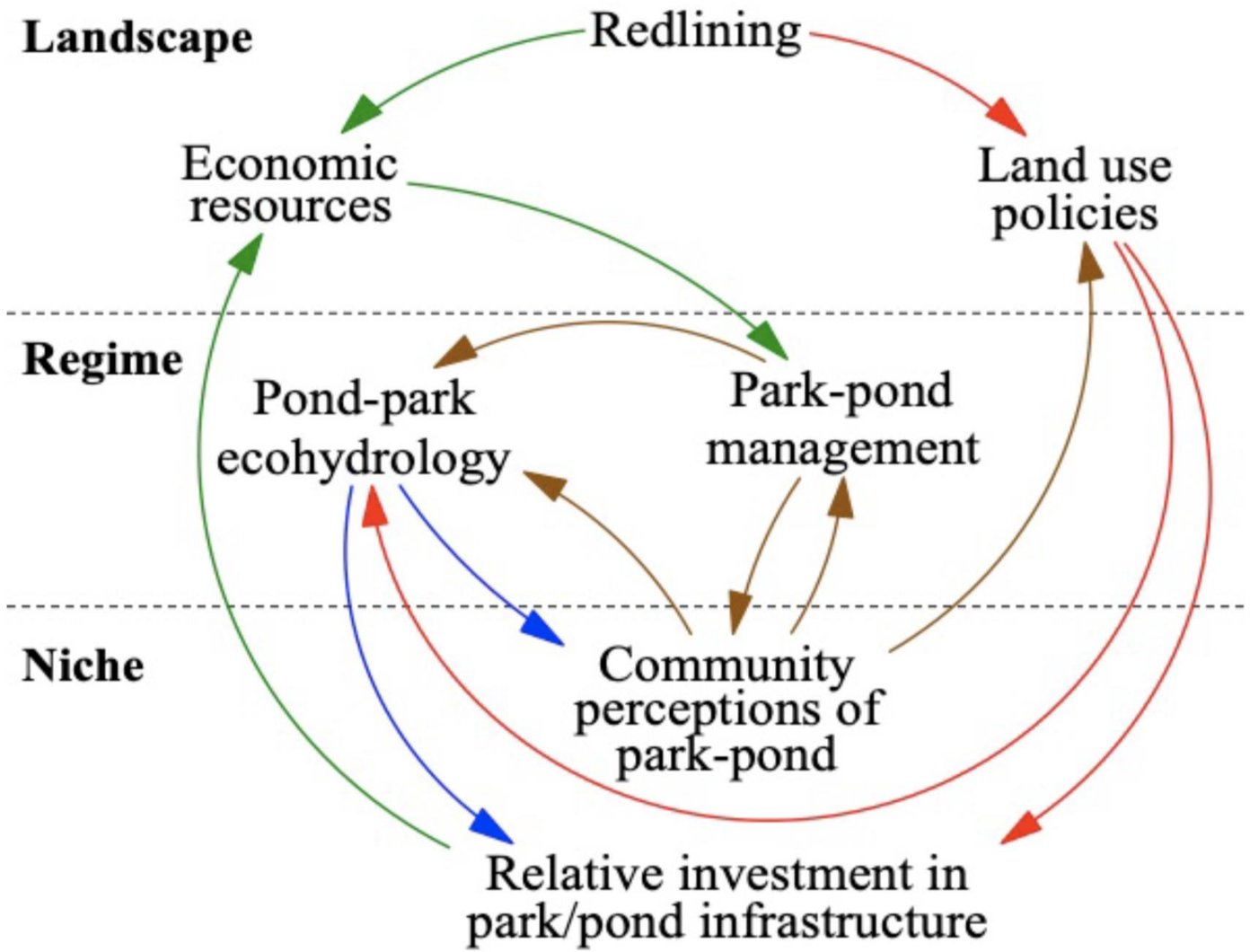
Causal Loop Diagram of Onsite Wastewater Treatment Management for Nutrient Pollution in the Belizean Cayes. **Credit: Daniel Delgado, William Alex Webb, Christine Prouty, Rebecca Zarger, Luis Garcia**

International community engagement with communities of color?

Germany vs Belize?

Do students of color feel more comfortable in communities of color?

Learning from student experiences while working with communities of color internationally



Initial conceptual diagram of a socio- ecosystems model for community engaged decision making for stormwater management in Tampa, FL. Credit: Rebecca Zarger, Maya Carrasquillo, Christine Prouty, David Bruce-Lewis, Mauricio Arias, Shawn Landry


Strong
COAST

Strong COASTS

"I think my positionality knowing that as a black woman in this space, that the work I am doing is directly impacting a community that I can self-identify with, has been a motivator to keep going in the program. So, I think if you are talking about not only recruiting students, but retaining students in a program that is already rigorous, you want to be able to provide a support system not just from a community level, but in terms of the research that we are equipped to do."

Maya Carrasquillo, ENV SP
Ph.D. Candidate, Environmental Engineering, USF
NRT Strong Coasts Fellow
Sloan Scholar

Thank You.

matrotz@usf.edu

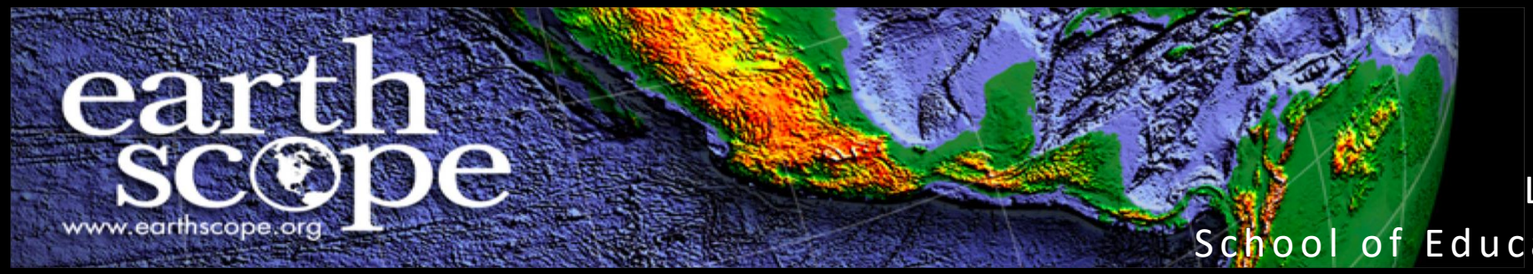
http://www.strongcoasts.org
https://medium.com/@strongcoasts
https://twitter.com/strongcoasts

This material is based on work supported by the National Science Foundation under Grant No. 1735320. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

for Attracting and Retaining Underrepresented Trainees for Data Science Related Careers

IDEAS³
Integrated Data-Driven Discovery in Earth and Astrophysical Sciences

LSST
Large Synoptic Survey Telescope



Lois Calian Trautvetter
School of Education and Social Policy
September 26, 2019

Program Components

- IDS Certificate
- IDEAS Traineeship (MS/PhD Students)
- IDEAS Fellowship — Traineeship with Funding (PhD students)

Citizen Science Project

Weekly Meetings

Machine Learning MeetUp

Summer Internship

Communication Workshops

Focus Summer Schools

DATA_SCI 401 Data-Driven Research

DATA_SCI 421 Statistical Methods

DATA_SCI 422 Inverse Methods

DATA_SCI 423 Machine Learning

One elective from ~15 options

IDEAS is a Research Traineeship program supported by the National Science Foundation under grant DGE-1450006.

NSF Research Traineeship Goals

- Catalyze and **advance cutting-edge interdisciplinary research** in high priority areas

- Prepare STEM graduate students more effectively for successful **careers within or outside academia**

- Develop models and knowledge that will promote transformative **improvements in graduate education**

- **Increase the number of students pursuing DESE graduate degrees and projects, especially females and URMs**

Using STEM Graduate Education to Increase Diversity

- **We know STEM graduate education has some deficiencies:**
  - Not always aligned with disciplinary, workforce, societal, and student needs;
  - Students are narrowly trained and lack transferable professional skills; and
  - Student career mentoring is narrowly focused on academe, although there are many non-academic opportunities

- **What we are discovering we need to do:**
  - **Enhance recruitment practices** (e.g., focus on MSIs, affinity and professional groups; use "high touch" recruitment strategies that will give "a competitive advantage")

  - **Offer flexible interdisciplinary**, intellectual programming that provides the skills and knowledge to **address "real world problems"** and appeal to **students that are interested in academic <u>and</u> the professional sectors**

  - **Share best practices across disciplines** (e.g., establish summer programs, interdisciplinary collaborations, etc.)

  - **Monitor graduate students' feedback and offer professional development to faculty and staff** if needed for retention

Effective IDEAS Recruitment Methods

- **Concrete strategies and practices for recruitment that pay-off**
  - **Institutional commitment and self awareness, especially to underrepresented groups**
    - Northwestern University's Graduate School has on-campus summer research for minority undergraduates; faculty-showcasing; targeted recruitment events at minority serving institutions (MSIs– e.g., Spelman, Howard, Morehouse, Maryland Baltimore County, University of Puerto Rico); professional conferences (e.g., SACNAS, AISES, NSBE, ERN, Grace Hopper); visit affinity and groups (e.g., SWE, SHPE); engage alumni in career-related professional development; provide recruiting weekends for admitted graduate students; and offer financial monies/incentives
    - IDEAS: website; recruitment postcard; in-person and virtual information sessions for both students and advisors in different disciplines; leverages female IDEAS faculty; other recruitment practices by staff and trainees at MSIs and other institutions; conferences
  - **Strategic admissions policies and using "high-touch" efforts – school, institution, department levels**
  - **Cooperation across disciplines to help with recruitment**
  - **Collect and assess national and institutional data for recruitment purposes**
- **Success begets further success**
  - **"Critical mass" makes recruiting much easier – for both students and faculty members**
  - **Each year – trainee cohorts increase in diversity by discipline, gender, race and ethnicity**
- **Having a sense of purpose – "helping others"**
  - **Providing appealing career options both in the academic and professional sector (e.g., internships)**
  - **Sense of "helping others" (IDEAS examples: Citizen Science projects and outreach programs in K-12 and colleges) can foster a sense of community and belonging**

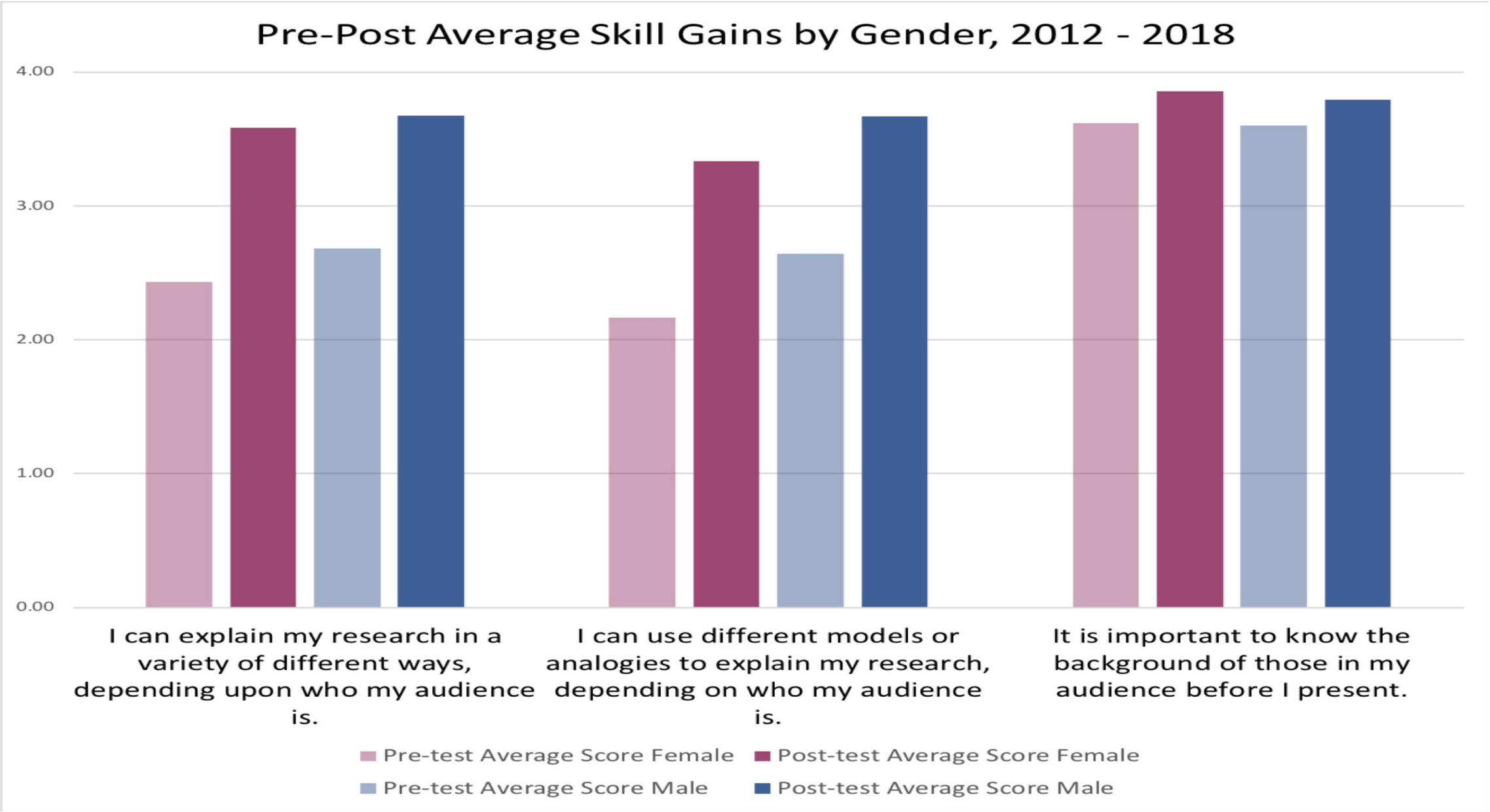
IDEAS Retention Strategies

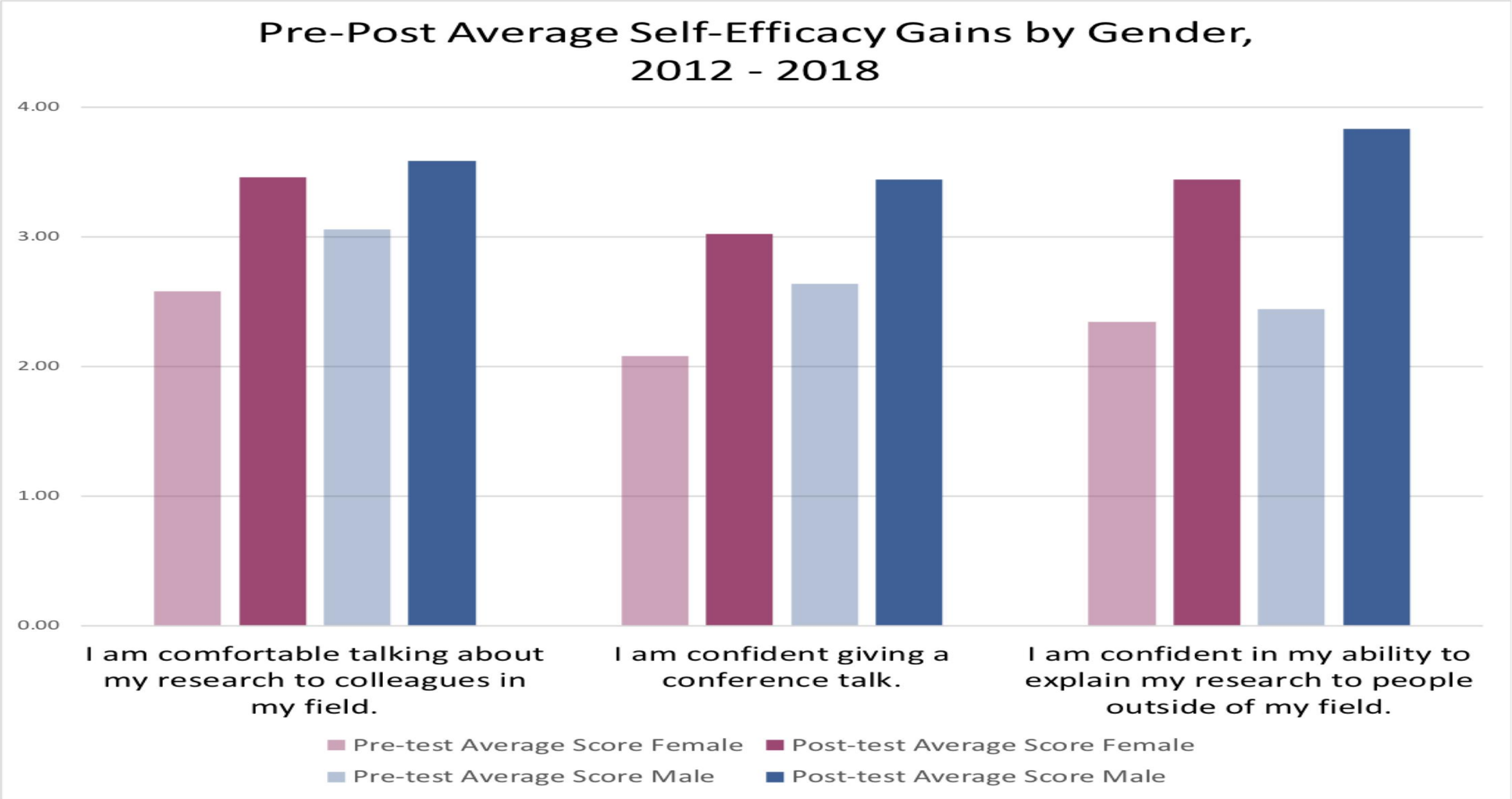
1. Providing summer programming (e.g., Python programming, visualization)

- Creates a baseline for all and prepares students for the coursework
- Makes all students comfortable

2. Increasing Communication Skills through a Communication Program (RSG)

- Provides more efficient communication of scientific ideas across disciplines – "training great researchers into great communicators"
- Makes all students more confident


Pre-Post Average Skill Gains by Gender, 2012 - 2018
4.00
3.00
2.00
1.00
0.00
I can explain my research in a variety of different ways, depending upon who my audience is.
I can use different models or analogies to explain my research, depending on who my audience is.
It is important to know the background of those in my audience before I present.
Pre-test Average Score Female
Post-test Average Score Female
Pre-test Average Score Male
Post-test Average Score Male


Pre-Post Average Self-Efficacy Gains by Gender, 2012 - 2018
4.00
3.00
2.00
1.00
0.00
I am comfortable talking about my research to colleagues in my field.
I am confident giving a conference talk.
I am confident in my ability to explain my research to people outside of my field.
Pre-test Average Score Female
Post-test Average Score Female
Pre-test Average Score Male
Post-test Average Score Male

IDEAS Retention Strategies Continued:

3. Targeted collaborative and interdisciplinary instruction and hands on experiences, and peer interactions in and out of the classroom

- Students have weekly meetings together (e.g., solve problems, share and discuss their research)
- Faculty teaching the data science courses have biweekly meetings with each other
- Sharing best practices across the disciplines for both students and faculty
- Offer professional development to support faculty and staff if needed (e.g., mentoring, collaboration, and/or conflict resolution)

4. Active faculty mentoring, accessible role models, and sense of community for both students and faculty

- Supportive faculty and staff that recruit, provide outreach, and advise and mentor students for both academic and professional careers
- Outside of academia guest speakers
- Meeting quarterly with the NRT trainees and faculty advisors separately to receive and give feedback
- Co-advising by an interdisciplinary faculty pair; combined with the Citizen Science Project development provides long term collaborations and larger exposure to mentors and role models

5. Internships and other opportunities (e.g., citizen science projects) to apply skills and knowledge to "real world" situations and provide sense of purpose

QUESTIONS?

NSF Grant Number 1450006

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Impact of an MS Bridge-to-PhD Traineeship Structure

Collaborative Research: NRTDESE: Interdisciplinary Research Traineeships in Data-Enabled Science and Engineering of Atomic Structure (SEAS)

Caesar Jackson and Kimberly Weems
North Carolina Central University

Ashleigh R. Wright, Elizabeth C. Dickey, Brian Reich
North Carolina State University

2019 NSF RESEARCH TRAINEESHIP (NRT) ANNUAL MEETING

Lightning Talk Session: *Increasing Retention of Underrepresented Trainees*

Northwestern University | Evanston, IL

September 25-27, 2019

Data-Enabled Science and Engineering of Atomic Structure (SEAS) Traineeship Program

The Data-Enabled Science and Engineering of Atomic Structure (**SEAS**) traineeship program, focuses on training graduate students to do *multidisciplinary research on materials characterization and production*.

SEAS is a collaboration between a master's degree-granting, historically black college/university (**HBCU**), and PhD degree-granting predominantly white institution (**PWI**).

SEAS *promotes and enhances diversity* within the traineeship and the larger professional community, particularly through the integral **Bridge-to-PhD** traineeship component between NCCU and NC State.

Data Enabled Science & Engineering of Atomic Structure

NC STATE UNIVERSITY

NCCentral UNIVERSITY

NSF

SEAS Bridge-to-PhD Component

OBJECTIVES:

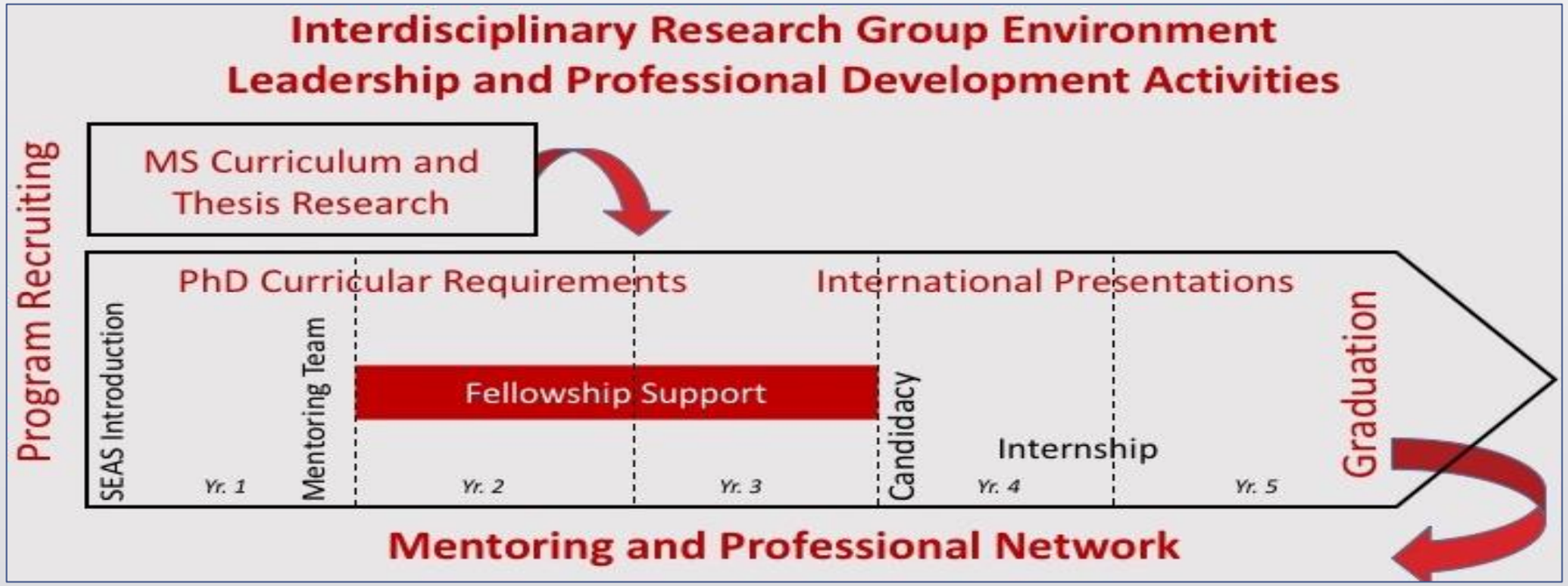
- Prepare pre-doctoral (Master's) trainees at North Carolina Central University (NCCU) for PhD programs in engineering and mathematical science disciplines.
- Build on established academic and research relationships between NCCU and NC State.
- Ensure that Bridge students are well-integrated in Science and Engineering of Atomic Structure (SEAS) program at NC State.
- Promote and enhance diversity within the traineeship and the larger professional community.

RECRUITMENT/ADMISSION:

- ***NRT funding for four (4) SEAS Bridge trainees*** *over the 5-year grant*.
- Candidates are admitted to NCCU Master's degree programs in Fall Semester through standard admissions process: *Mathematics, Chemistry, Physics*
- SEAS Bridge Selectees begin in Spring Semester with NRT funding.

SEAS Education & Training

MS Thesis (CHEM, MATH, PHYS)	Professional Development
▪ Inter-institutional courses ▪ Co-advised Master's theses ▪ Laboratory rotations ▪ Interdisciplinary Research Group (IRG) Meetings	▪ Professional Development Seminars ▪ NCCU-hosted seminars ▪ Participation in professional organizations/conferences ▪ Industry Internships



Data Enabled Science & Engineering of Atomic Structure

NC STATE UNIVERSITY

NCCentral UNIVERSITY

NSF

SEAS Bridge-to-PhD

OUTCOMES:

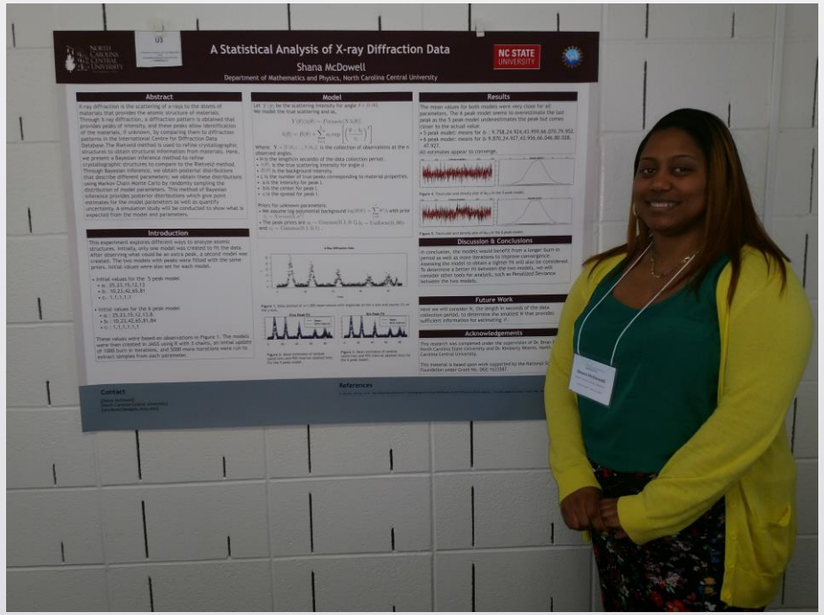
- Trained three (3) SEAS Bridge trainees during the three years of the five-year grant.
- Three (3) have graduated with MS degree and have been admitted into PhD programs.

Gender	NCCC Graduate Program	Yr Admitted NCCU	Sem Begin SEAS Bridge	NRT Funded?	MS Degree Awrd Date	Admitted PhD program?	PhD Institution	PhD Major
M	Mathematics	2016	2017	Y	2018	Y	Howard University	Mathematics
F	Mathematics	2015	2017	Y	2019	Y	Univ of AL at Birmingham	Biostatistics
M	Mathematics	2017	2018	Y	2019	Y	NC State	Mathematics
F	Physics	2018	2018	N				

CURRENT STATUS:

- One non-NRT funded trainee is active and on track.
- Three new candidates are being considered.

I learned how to communicate across disciplinary lines and to apply the skills learned…



Great opportunities to collaborate and build networks as well as to learn new skills…

Data Enabled Science & Engineering of Atomic Structure

NC STATE UNIVERSITY

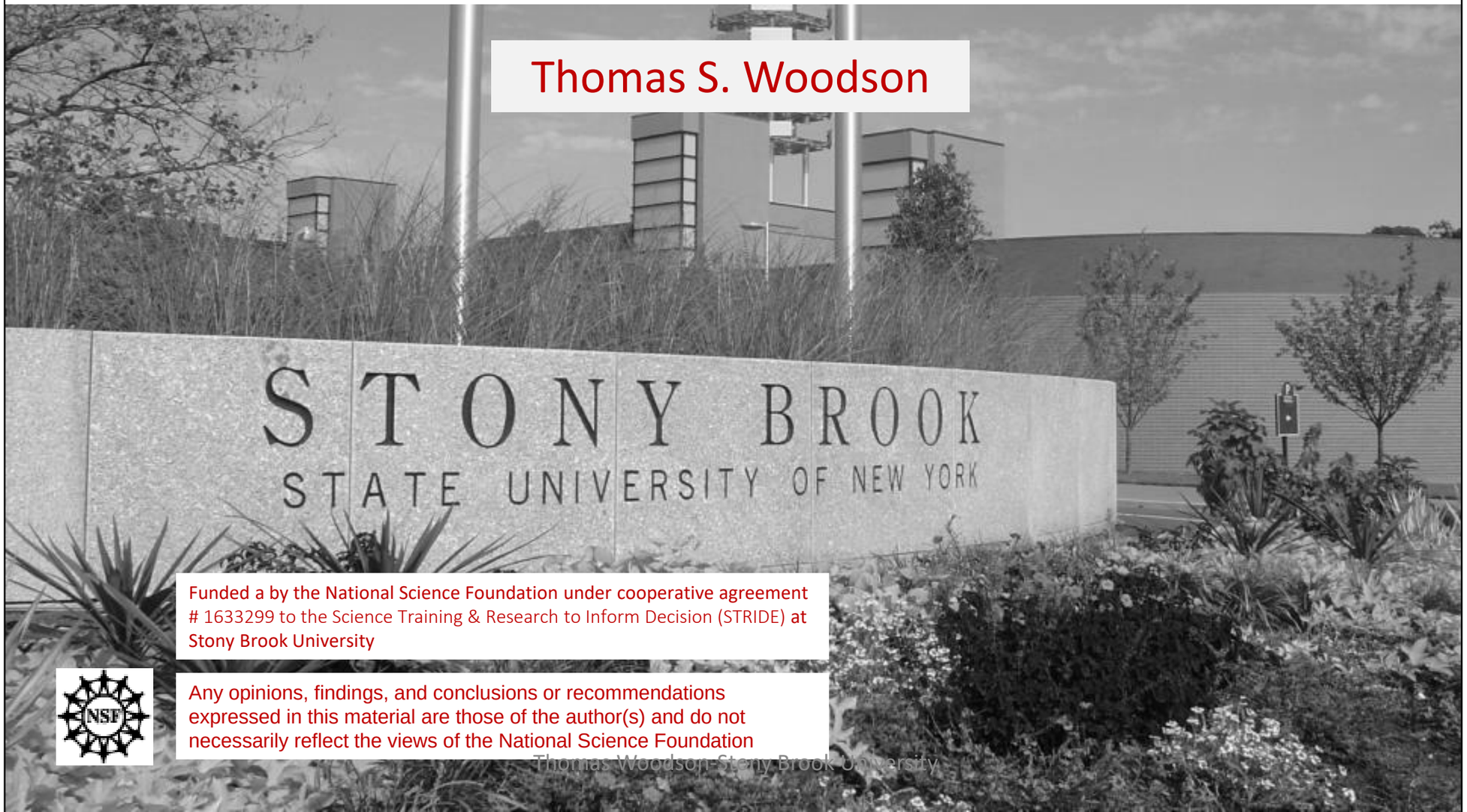
NCCentral UNIVERSITY

NSF

Questions?

Retention: Peer Groups are Key

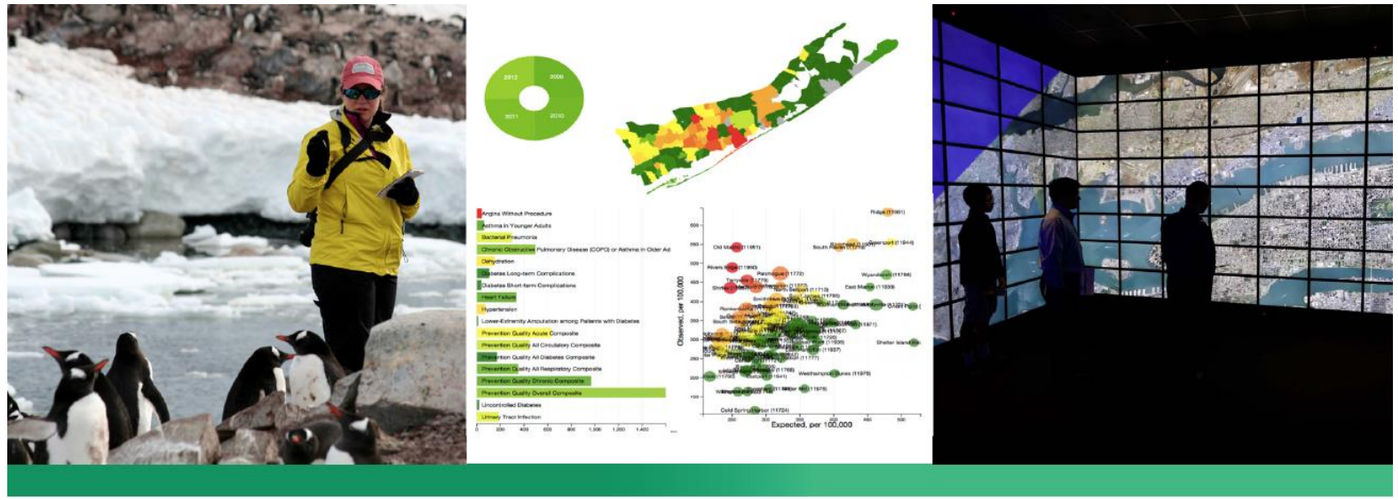
Thomas S. Woodson



Funded a by the National Science Foundation under cooperative agreement # 1633299 to the Science Training & Research to Inform Decision (STRIDE) at Stony Brook University

STRIDE

Science Training and Research to Inform DEcisions



Stony Brook University and the Institute for Advanced Computational Science invite students to take part in STRIDE: Science Training and Research to Inform DEcisions.

Within all sectors of industry and government, effective decision making depends on the ability of scientists to interpret data and communicate results in a way that supports the decision-making process. Learn how to communicate your research to the policy makers; understand the perspectives of stakeholders; and translate scientific uncertainty into action.

Retention: Peer Groups

Recruiting


I WANT YOU
FOR U.S. ARMY
NEAREST RECRUITING STATION


GEE !!
I WISH I WERE
A MAN
I'd JOIN
The NAVY
UNITED STATES NAVY
1935 STATE STREET, SANTA BARBARA, CA

Strategically create teams

- Size of teams
  - 7-15
  - Large and small groups
- Grouping students?
  - Major?
  - Interests?
  - Age?

Team Building

- Fun activities
- Make things “mandatory”
- Time together

Peer "Mentors"

? Questions

Retaining the Underrepresented Student in STEM

TOCCARA HOUSTON
GEORGIA INSTITUTE OF TECHNOLOGY
SEPTEMBER 26, 2019

Overview

The demand for qualified STEM professionals is high, but the supply of STEM workers to fill these positions is at risk if underrepresented groups are not engaged in these fields. Implementing strategies that are tailored to the academic and social support through various channels, will enable students to maximize their potential. For the support to be available, higher education needs leaders who are willing to invest institutional resources to implement these strategies for the success of the students.

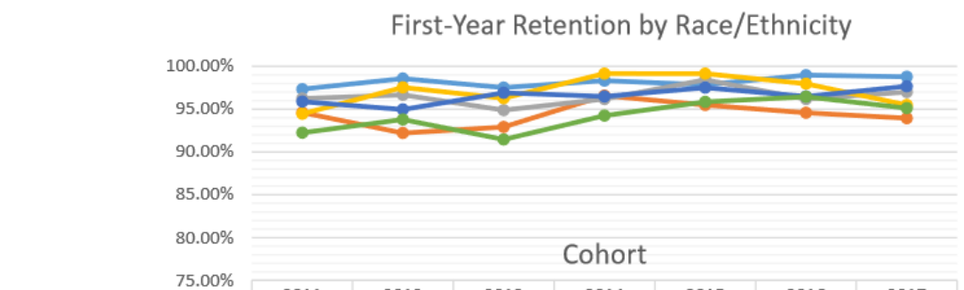
What is an underrepresented minority? (URM)

According to the National Action Council in Minority Education(NACME), an underrepresented minority consist of African Americans, American Indians/Alaska Natives, and Latinos— who have historically comprised a minority of the U.S. population are growing in size and influence.

They currently make up 30% of the U.S. population, but by 2050, these groups will account for greater than 40% of the U.S. population. Underrepresented minorities are particularity underrepresented in the fields of science, technology, engineering, and mathematics (STEM).

Retention Rates

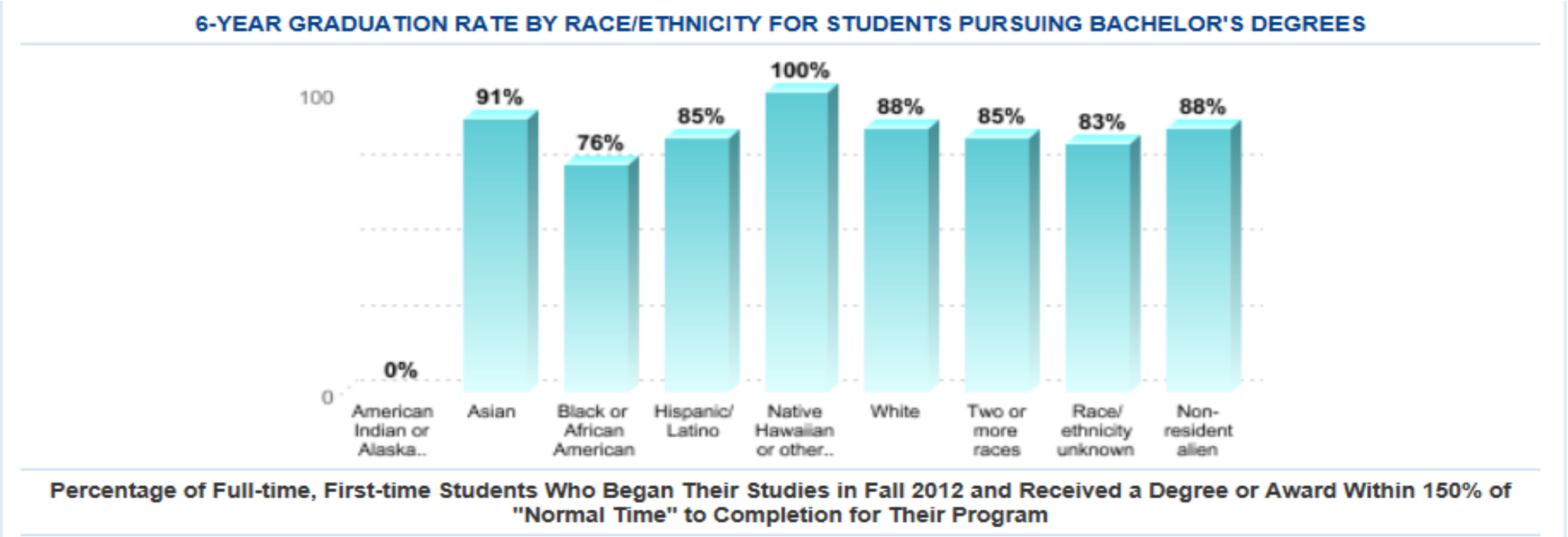
Student Retention by Race/Ethnicity



	2011	2012	2013	2014	2015	2016	2017
Asian	97.35%	98.58%	97.52%	98.34%	97.85%	98.98%	98.78%
Black/African-American	94.61%	92.21%	92.90%	96.58%	95.48%	94.57%	93.94%
Hispanic/Latino	96.25%	96.67%	94.89%	96.20%	98.44%	96.17%	97.00%
Multi-racial	94.44%	97.54%	96.26%	99.16%	99.14%	97.98%	95.50%
White/Caucasian	95.88%	94.96%	96.92%	96.49%	97.50%	96.49%	97.68%
Other/Unknown	92.24%	93.80%	91.46%	94.24%	95.85%	96.45%	95.11%

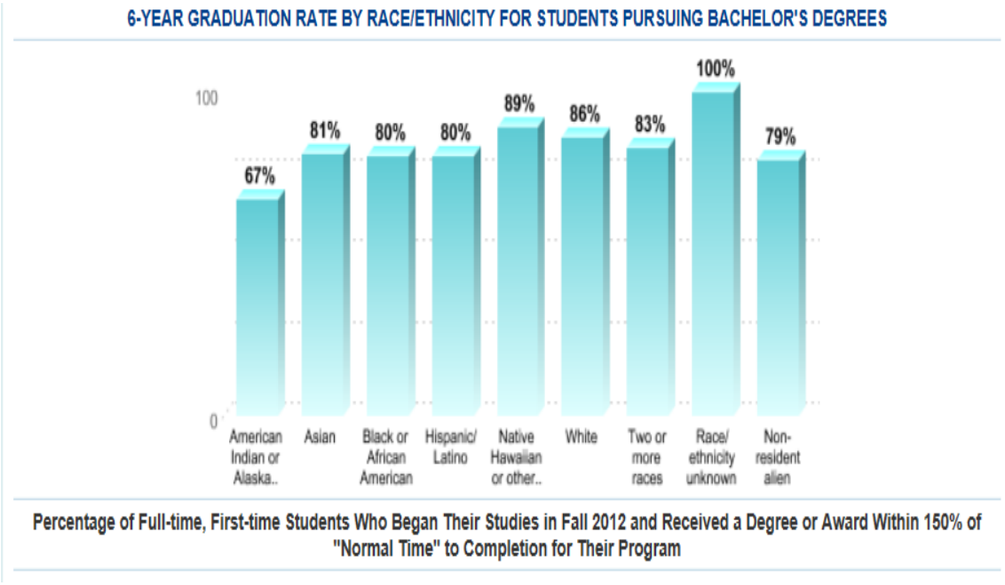
**Ga Tech IRP Annual Study Fall 2018*

- The first-year retention rates have increased over time from 2011-2017 for all race/ethnicity categories.
- The retention rate for African American students has been historically lower than for other races. Since 2014, retention rates have gradually declined by approximately one percentage point per cohort.

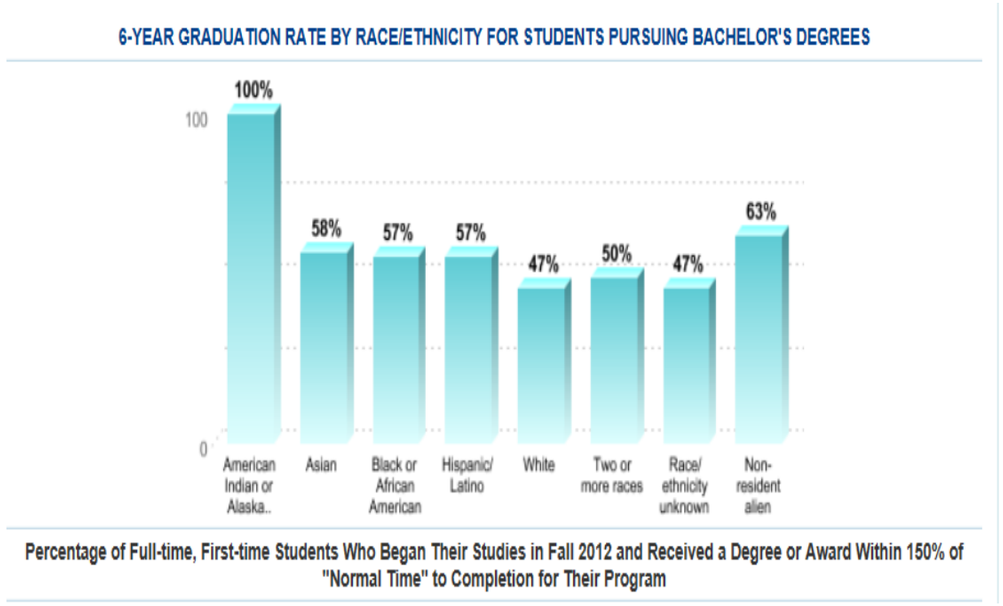


Source: *National Center for Education Statistics*

University of Georgia



Georgia State University



Source: ***National Center for Education Statistics***

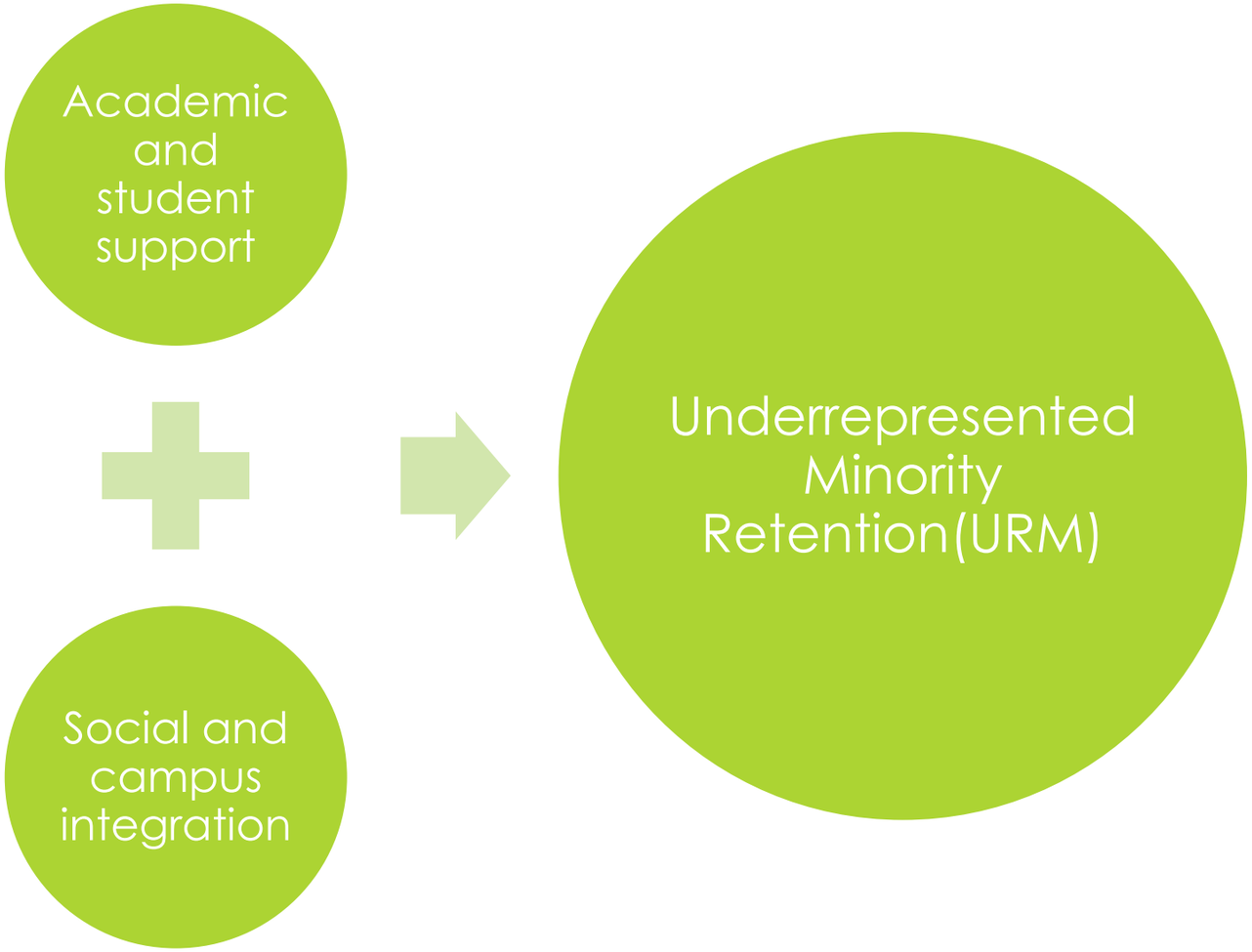
Recruitment and Retention

How do we get the underrepresented population?(Outreach)

- Raise awareness of STEM careers through K-12 and enlarge the pool of college bound minority students.
- Public education activities designed to increase the awareness in the minority communities about the importance of college and on how to best prepare their children for post-secondary academic success.

How do we get the underrepresented population? (Recruitment)

- Visit schools with a substantial population of minority enrollments to promote graduate training opportunities.
- Communicate directly with selected groups of prospective applicants as well with deans and department chairs at historically black colleges and universities and at other schools having substantial minority enrollments.
- Professional society subgroups for members from underrepresented minority groups (ex. SHPE, SACNAS, HACU, NSBE, etc.)
- Invite prospective minority applicants to visit the campus and meet with faculty and students.
- Send minority graduate students to local schools to talk about their research and how they decided on a career in STEM.
- Recruit students of color in community centers, churches, and other nontraditional settings.
- Involve current minority students and alumni in the recruitment effort.
- Engage the parents and other family members rather than focusing exclusively on the prospective student.


Academic and student support
Social and campus integration
Underrepresented Minority Retention(URM)

Social and Campus Integration

Big Idea:

Create formal and informal social connections between faculty and students professional learning

Social and Campus Integration

Recommendations:

- Create high-impact engagement activities such as learning communities, internships, summer programs, etc.
- Mentoring conducted by peers and advisors
- Create tutoring and study groups
- Support minority student group organizations
- Increase peer partnership programs aimed at linking upper-class students from underrepresented groups with new freshmen and transfer students of similar groups.

Barriers in social and campus integration:

1. Stereotyping
2. Underrepresented minorities are likely to find themselves academically and socially isolated
3. Students from economically and culturally disadvantaged backgrounds lacking the same level of information as their peers.

Academic and Student Support

Big Idea:

Academic and student support services provide the help that students may need in dealing with the demands of their academic programs or in dealing with transition in a new cultural setting.

Academic and Student Support

Recommendations:

- Faculty mentoring that can help support underrepresented STEM students throughout their education.
- Intrusive and increased advising that should include intentional proactive outreach to students, particularly to the needs of the URMS
- Create learning communities(LCs) so that the learning needs of the students is addressed and will also provide structured collaboration between faculty, staff and students.
- Orientation programs for the underrepresented student

Cultural Barriers to Graduate Programs

Sara Mata, Ph.D.
Research Associate for Corix Plains Institute
University of Oklahoma

-Access
-Retention
-Institutional Receptivity
-Excellence

Factors to Consider Diversity & Inclusion

https://cue.usc.edu/files/2016/01/Bensimon_The-Diversity-Scorecard.pdf

Access

Assessment of Prospective Students

Recruitment of Graduate Students (Where and Why)

Faculty Recreating Themselves

Retention

Time to Degree; Investment in Students

Teaching of Expectations; Knowing the Resources

Personal Perspective; Self-Care

Institutional Receptivity

Lack of Representation

Support Systems Built in to Graduate Programs (Student Orgs)

Infused Diversity and Inclusion at the Institutional level

Excellence

Gauging Excellence (GRE, etc.)

Addressing Imposture Syndrome

Expectations of Graduate Students

Questions?

....

THANK YOU

Sara Mata, Ph.D.

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https://eos3blog.wordpress.com